Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!

Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832
Email & Skype: info@chipsmall.com Web: www.chipsmall.com
Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China

TFT LCD Approval Specification

MODEL NO.: PQ 3Qi-01

Customer: _____

Approved by: _____

Note:

CONTENTS

REVISION HISTORY

Version	Date	Page (New)	Section	Description
Ver 1.0	Apr. 20, 2009	All	All	Initial customer release
Ver 1.1	June 16 2009			Modifications based on measured performance of first working samples
Ver 1.2	July 21, 2009			Updated electrical specifications
Ver 1.3	July 28, 2009		8	Optical specifications revised.
Ver 1.4	Sept 4, 2009		3, 8	Electrical and optical specifications revised.
Ver 1.5	Jan 22, 2010		8	Optical specifications revised
Ver 1.6	Jan 27, 2010		3.1, 3.3, 8	Power and optical characteristics updated
Ver 1.7	Mar 10, 2010		3.1, 3.3, 8	Power and optical characteristics updated
Ver 1.7.1	Mar 16, 2010	29	8	Updated white point tolerance
Ver 1.8	Apr 18, 2010		8	Added brightness in office lighting and sunlight
Ver 1.8.1	Apr 19, 2010		8	Corrected typo in table 8.2
Ver 1.9	June 4, 2010	29	3,1, 3.3, 8	Power and optical characteristics updated
Ver 2.0	July 13, 2010		3, 6, 8	Updated power, optics data, and reflectivity measurement method
Ver 2.1	July 21, 2010			Reorganized sections
Ver 2.2	Sept 19, 2011	7	2.1	Updated operating and storage temperature range

Note: All specifications are subject to change without notice.

1 GENERAL DESCRIPTION

1.1 OVERVIEW

PQ 3Qi-01 is a 10.1" TFT Liquid Crystal Display module with LED backlight unit and 40 pin LVDS interface. This module supports 1024 x 600 Wide-SVGA (WSVGA) mode and can display 262,144 colors. This module also supports two low power modes: a transflective mode with lower color and a reflective black and white (64 grayscales) mode. The converter module for backlight is built in.

1.2 FEATURES

- WSVGA (1024 x 600 pixels) resolution
- 3.3V LVDS (Low Voltage Differential Signaling) interface with 1 pixel/clock
- Built in LED Converter
- Transmissive, transflective, and reflective display modes

1.3 APPLICATIONS

- Mobile notebook or netbook
- Multimedia tablet

1.4 GENERAL SPECIFICATI0NS

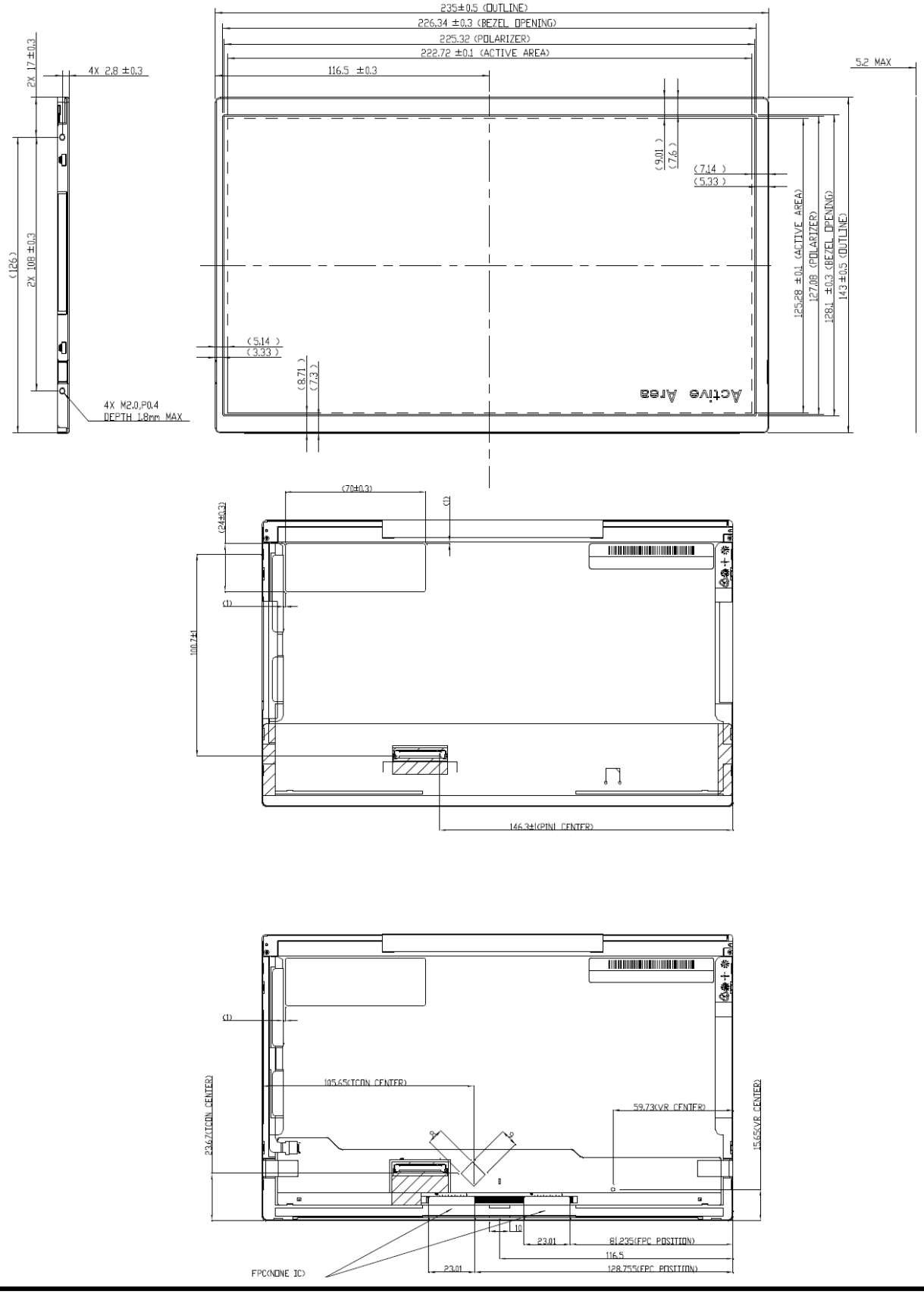
Item	Specification	Unit	Note
Active Area	222.72 (H) x 125.28 (V) (10.06" diagonal)	mm	(1)
Bezel Opening Area	226.34 (H) x 128.1 (V)	mm	
Driver Element	a-Si TFT active matrix	-	-
Pixel Number	1024 x R.G.B. x 600	pixel	(2)
Pixel Pitch	0.2175 (H) x 0.2088 (V)	mm	-
Pixel Arrangement	RGB vertical stripe + 3 reflective subpixels	-	-
Display Colors	262,144	color	-
Display Operating Modes	Transmissive, transflective, reflective. Normally black	-	-
Surface Treatment	Hard coating (3H), Anti-Glare	-	-

1.5 MECHANICAL SPECIFICATIONS

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal(H)	234.5	235.0	235.5	mm	(1)
	Vertical(V)	142.5	143.0	143.5	mm	
	Thickness(T)	-	4.9	5.2	mm	
Weight		-	185	195	g	

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.

Note (2) Each pixel is composed of 3 transmissive subpixels (RGB) and 3 reflective subpixels (grayscale).


235±0.5 (OUTLINE)
226.34 ±0.3 (BEZEL OPENING)
225.32 (POLARIZER)
222.72 ±0.1 (ACTIVE AREA)
116.5 ±0.3
5.2 MAX
4X 2.8 ±0.3
2X 17±0.3
(126)
2X 108±0.3
4X M2.0,P0.4
DEPTH 1.8mm MAX
(9.01)
(7.6)
(7.14)
(5.33)
(5.14)
(3.33)
(8.71)
(7.3)
Active Area
125.28 ±0.1 (ACTIVE AREA)
127.08 (POLARIZER)
128.1 ±0.3 (BEZEL OPENING)
143±0.5 (OUTLINE)
(70±0.3)
(1)
(24±0.2)
100.7±1
146.3±1(PIN1 CENTER)
105.65(TCON CENTER)
59.73(VR CENTER)
236.27(TCON CENTER)
15.65(VR CENTER)
10
23.01
8(.235(FPC POSITION)
116.5
128.75(FPC POSITION)
FPC(NONE IC)

2 ABSOLUTE MAXIMUM RATINGS

2.1 ABSOLUTE MAXIMUMS, ENVIRONMENTAL

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T_{ST}	-20	+70	ºC	(1)
Operating Ambient Temperature	T_{OP}	0	+50	ºC	(1), (2)
Extended Operational Temperature	T_{EOpp}	-20	+70	ºC	(1d)

Note (1) Temperature and relative humidity range is shown in the figure below:

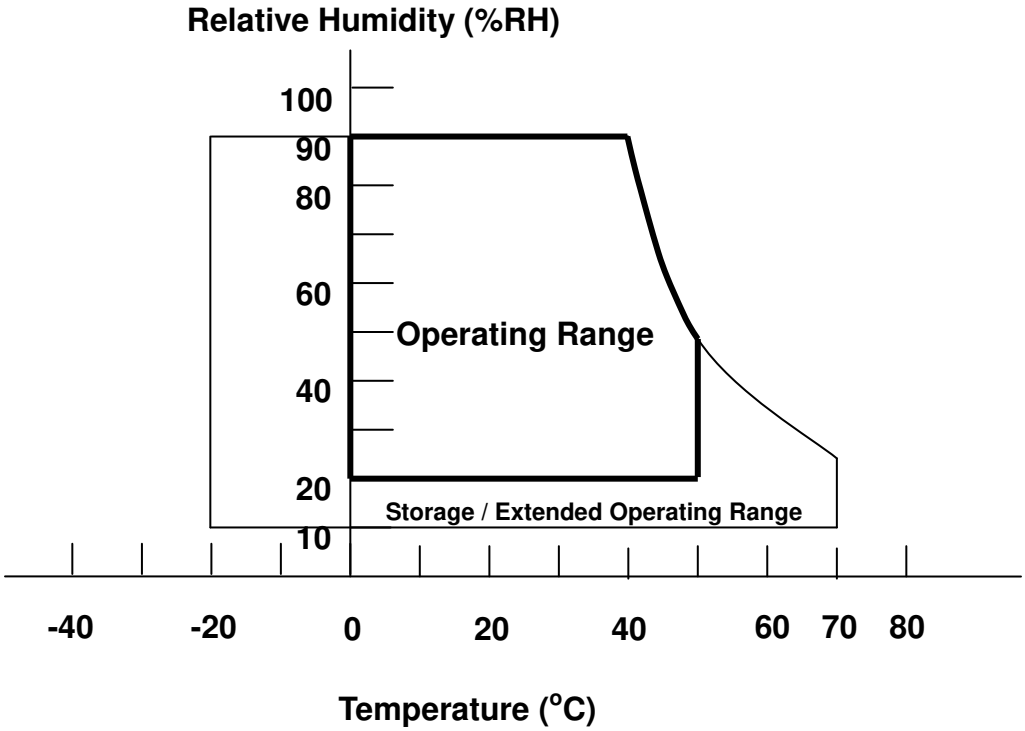
(a) 90 %RH Max. (Ta <= 40 ºC)

(b) Wet-bulb temperature should be 39 ºC Max. (Ta > 40 ºC)

(c) No condensation

(d) Panel will function but may not meet performance specifications in the extended operational temperature range.

Note (2) The temperature of panel surface area should be 0 ºC min. and 50 ºC max.



2.2 ABSOLUTE MAXIMUMS, ELECTRICAL

Permanent damage to the device may occur if maximum values are exceeded. Operation should be restricted to the conditions described under Normal Operating Conditions.

2.2.1 TFT LCD MODULE

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	V_{CC}	-0.3	+4.0	V	
Logic Input Voltage	V_{IN}	-0.3	V_{CC}+0.3	V	

2.2.2 BACKLIGHT CONVERTER INPUT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Converter Input Voltage	LED_V_{CC}	-0.3	+25.0	V	
Converter Control Signal	LED_PWM	-0.3	+5.5	V	
Converter Control Signal	LED_EN	-0.3	+5.5	V	

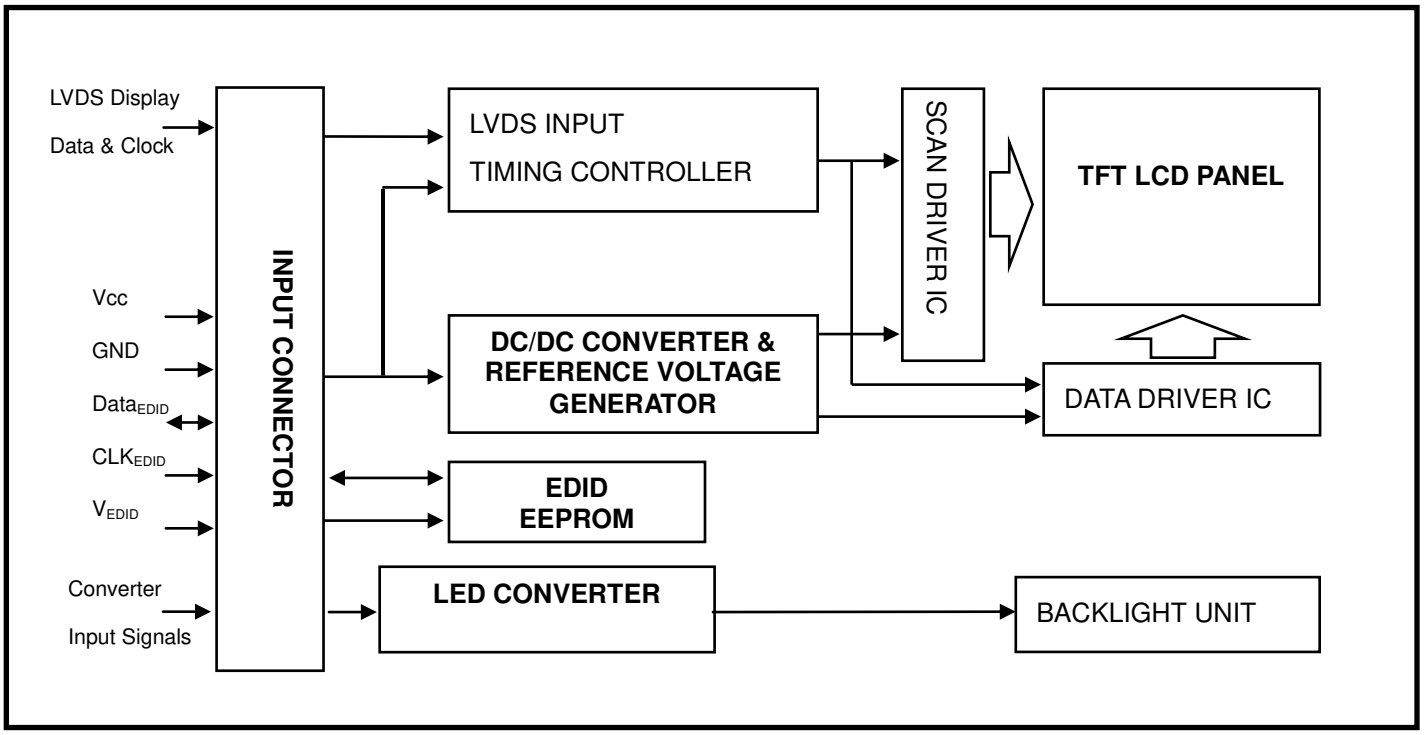
2.2.3 LED LIGHT BAR UNIT

Item	Value		Unit	Note
	Min	Max.		
LED Light Bar Power Supply Voltage	-45	30.6	V_{DC}	(1)
LED Light Bar Power Supply Current	0	75	mA_{DC}	

Note (1) Specified values are for the LED light bar (Refer to Section 3.5 for further information).

3 ELECTRICAL CHARACTERISTICS

3.1 FUNCTIONAL BLOCK DIAGRAM



3.2 LCD ELECTRONICS SPECIFICATION

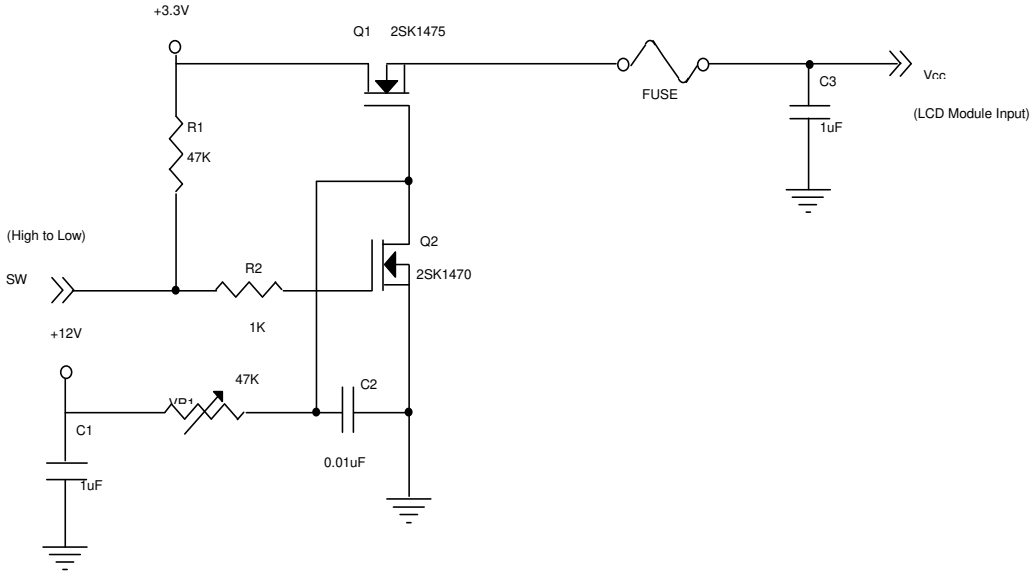
Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		Vcc	3.0	3.3	3.6	V	-
Ripple Voltage		V_{RP}	-	50		mV	-
Rush Current		I_{RUSH}	-	-	1.5	A	(2)
Initial Stage Current		I_{IS}	-	-	1.0	A	(2)
Power Supply Current	White	Icc	179	203	228	mA	(3)a
	Black		135	153	171	mA	(3)b
LVDS Differential Input High Threshold		$V_{TH(LVDS)}$	-	-	+100	mV	(4), V_{CM}=1.2V
LVDS Differential Input Low Threshold		$V_{TL(LVDS)}$	-100	-	-	mV	(4) V_{CM}=1.2V
LVDS Common Mode Voltage		V_{CM}	1.125	-	1.375	V	(4)
LVDS Differential Input Voltage		$\|V_{ID}\|$	100	-	600	mV	(4)
Terminating Resistor		R_T	-	100	-	Ohm	-

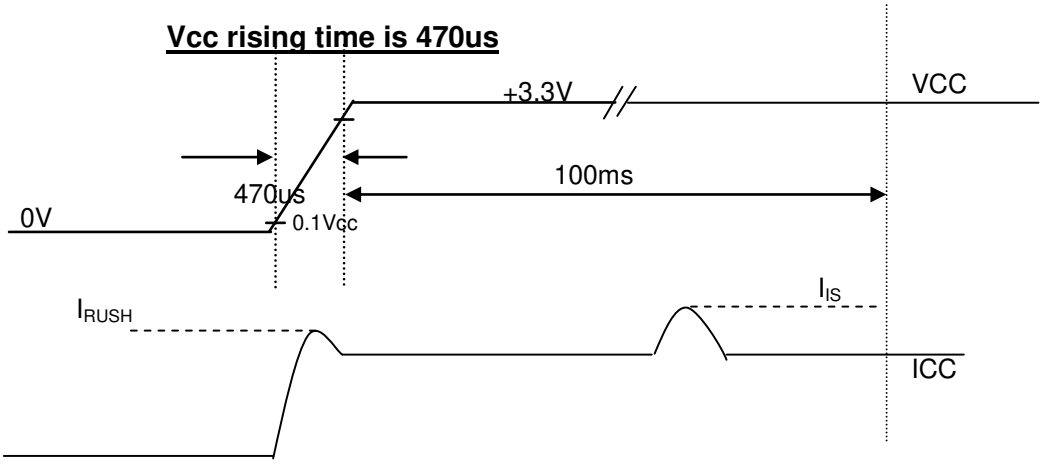
Note (1) The ambient temperature is Ta = 25 ± 2 ºC.

Note (2) I_{RUSH}: the maximum current when V_{CC} is rising

IIS: the maximum current of the first 100ms after power-on

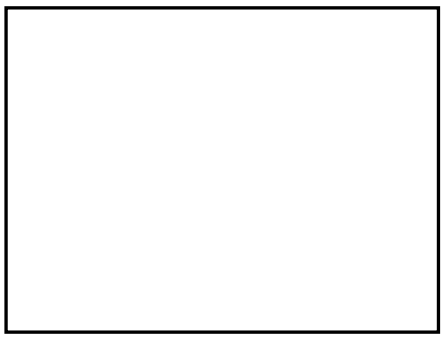
Measurement Conditions: Shown in the following figure. Test pattern: black.





Note (3) The specified power supply current is under the conditions at Vcc = 3.3 V, Ta = 25 ± 2 ºC, DC and f_v = 60 Hz, with a power dissipation check pattern (below) displayed.

a. White Pattern

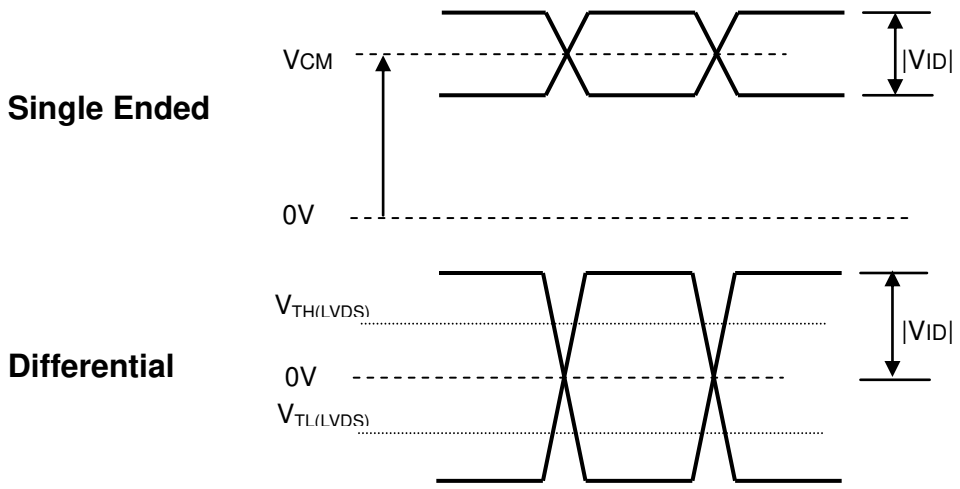


Active Area

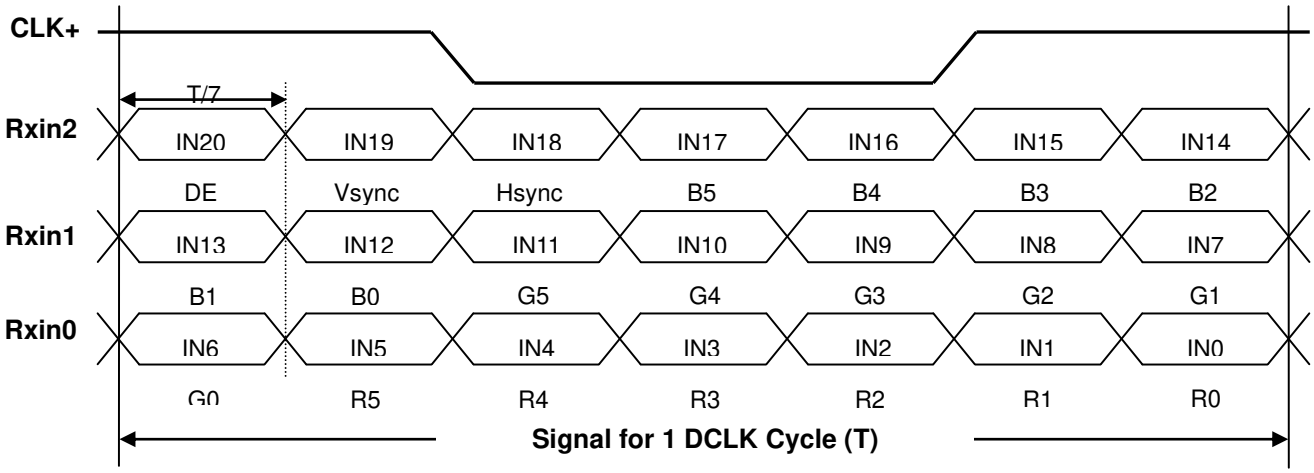
b. Black Pattern

Active Area

Note (4) The parameters of LVDS signals are defined as the following figures.



3.3 LVDS DATA FORMAT



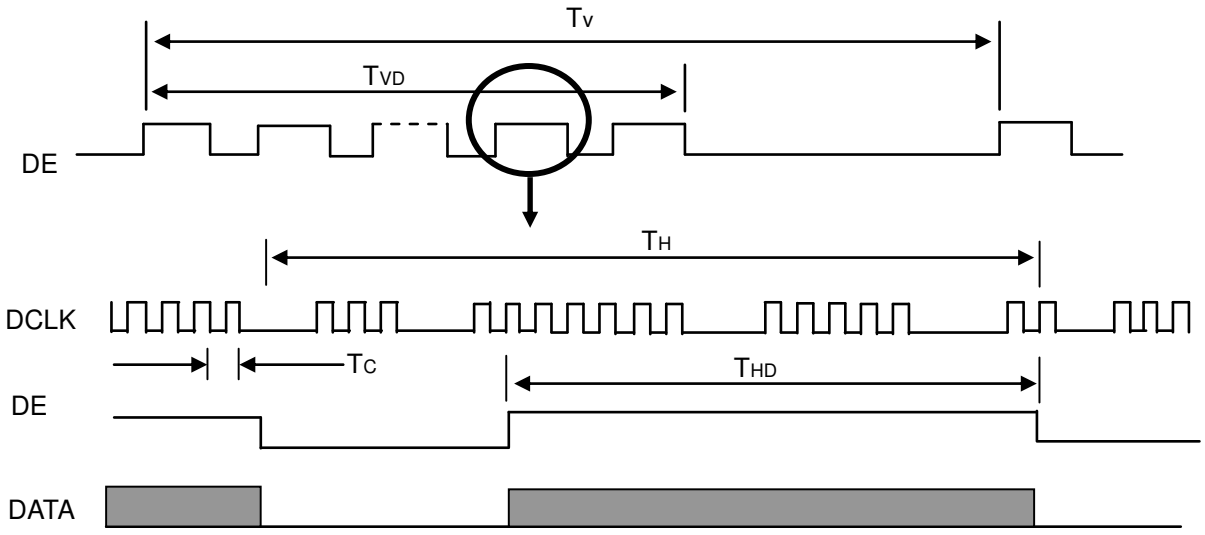
3.4 INPUT SIGNAL TIMING SPECIFICATIONS

The input signal timing specifications are shown as the following table and timing diagram.

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
DCLK	Frequency	1/Tc	21.74	43.97	46.15	MHz	-
DE	Vertical Total Time	TV	602	619	624	TH	-
	Vertical Active Display Period	TVD	600	600	600	TH	-
	Vertical Active Blanking Period	TVB	TV-TVD	19	TV-TVD	TH	-
	Horizontal Total Time	TH	1104	1184	1240	Tc	-
	Horizontal Active Display Period	THD	1024	1024	1024	Tc	-
	Horizontal Active Blanking Period	THB	TH-THD	160	TH-THD	Tc	-

Note (1) Because this module is operated in DE only mode, Hsync and Vsync are ignored.

INPUT SIGNAL TIMING DIAGRAM



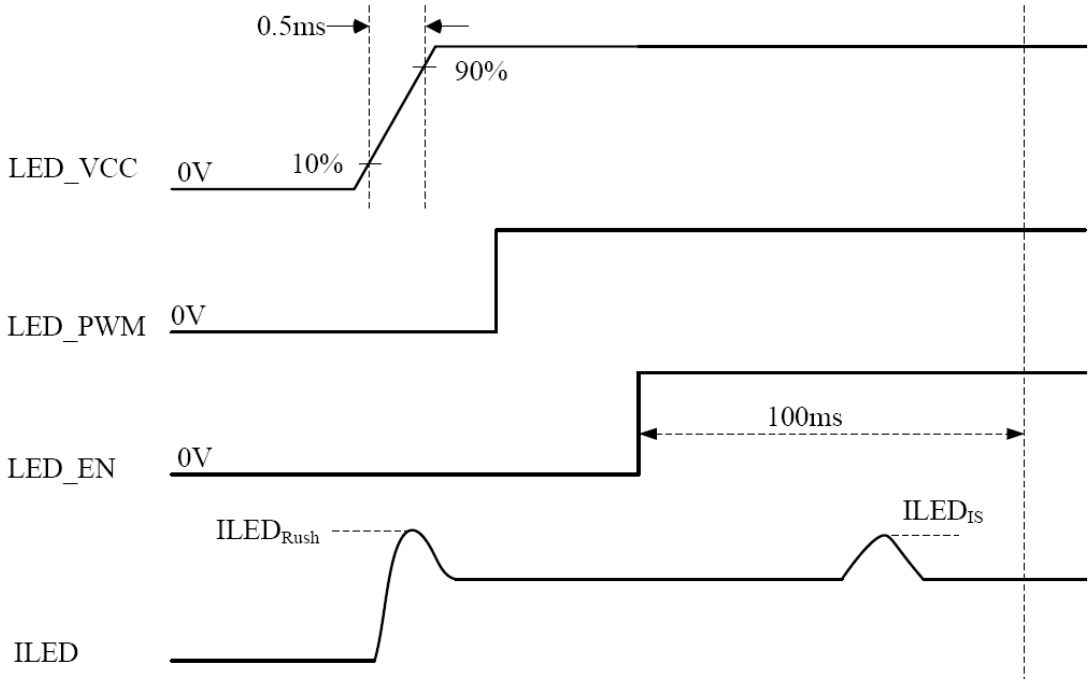
3.5 LED BACKLIGHT CONVERTER SPECIFICATIONS

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Converter Input power supply voltage		LED_V_{CC}	4.5	18.7	21.0	V	
Converter Rush Current		$ILED_{RUSH}$			1.5	A	(1)
Converter Initial Stage Current		$ILED_{IS}$			1.5	A	(1)
EN Control Level	Backlight on	LED_EN	2.3	-	5.5	V	
	Backlight off		0	-	0.8	V	
PWM Control Level	PWM High Level	LED_PWM	2.3	-	5.5	V	
	PWM Low Level		0	-	0.8	V	
PWM Control Duty Ratio			10	-	100	%	(2)
PWM Control Ripple Voltage		V_{PWM_pp}		-	100	mV	
PWM Control Frequency		f_{PWM}	190	-	2000	Hz	(3)
LED Power Current	LED_V_{CC} = Min	ILED	388	452	525	mA	(4)
	LED_V_{CC} = Typ		91	109	129	mA	(4)
	LED_V_{CC} = Max		83	97	113	mA	(4)

Note (1) $ILED_{RUSH}$: the maximum current when LED_V_{CC} is rising,
$ILED_{IS}$: the maximum current of the first 100ms after power-on,
Measurement Conditions: Shown as the following figure. LED_V_{CC} = Typ, Ta = 25 ± 2 ºC, f_{PWM} = 200 Hz, Duty=100%.

Note (2) If the PWM control duty ratio is less than 10%, there is some possibility that acoustic noise or backlight flash can be found. And it is also difficult to control the brightness linearity.

VLED rising time is 0.5ms



Note (3) If PWM control frequency is applied in the range less than 1 kHz, the “waterfall” phenomenon on the screen may be found. To avoid the issue, it’s a suggestion that PWM control frequency should follow the criterion as below.

PWM control frequency fPWM should be in the range

$$(N + 0.33) * f \leq f_{PWM} \leq (N + 0.66) * f$$

N : Integer $(N \geq 3)$

f : Frame rate

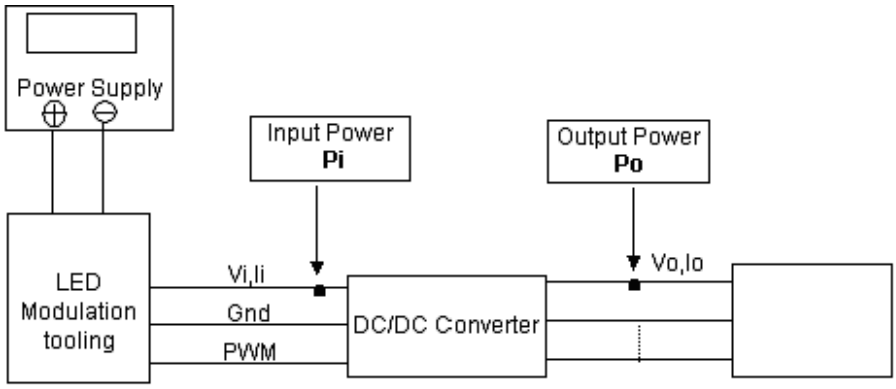
Note (4) The specified LED power supply current is under the conditions at “LED_VCC = Min., Typ., Max.”, Ta = 25 ± 2 ºC, f_{PWM} = 200 Hz, Duty=100%.

3.6 LED LIGHT BAR UNIT

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
LED Light Bar Power Supply Voltage	Vo	27	28.8	30.6	V	(1)(2) Duty 100%
LED Light Bar Power Supply Current	Io	57	60	63	mA	
Power Consumption (Transmissive Mode)	P_{OTM}	1.53	1.73	1.93	W	(1)(3) @Io=60mA, Duty 100%
Power Consumption (Transflective Mode)	P_{OTF}	0.61	0.69	0.78	W	(1)(3) @Io=60mA, Duty 40%
		0.15	0.17	0.2	W	(1)(3) @Io=60 mA Duty 10%
Power Consumption (Reflective Mode)	P_{ORF}	-	0	0.002	W	(1)
LED Life Time	L_{BL}	15000	-	-	Hrs	(4)

Note (1) In transmissive mode, power is given for typical current over the specified voltage range at 100% duty cycle. Dimming the backlight (reducing duty cycle) will reduce power in transmissive mode. In transflective mode, duty cycle is typically lower than Transmissive mode. Lower or higher PWM duty cycle will result in lower or higher power consumption, respectively. In transflective mode, brightness depends on backlight power and ambient light. In reflective mode, the backlight is turned off. Light bar power consumption is zero. For all measurements, Ta = 25 ± 2 ºC

Note (2) LED current is measured by utilizing a high frequency current meter as shown below:



Note (3) $P_O = I_O \times V_O$

Note (4) The lifetime of LED is defined as the time when it continues to operate under the conditions at Ta = 25 ±2 °C and I = 17 mA (Per EA) until the brightness becomes ≦ 50% of its original value.

3.7 DISPLAY MODE CONTROL

The display panel supports 3 modes: purely reflective, purely transmissive, and transflective. The mode is determined by the ambient light intensity and backlight intensity. The following truth table shows how different modes are selected.

Condition		Description	
Ambient Light	**Backlight**	**Mode**	**Notes**
Non-dark	Off	Reflective	Backlight off, reflective subpixels active, grayscale image, minimum power mode.
Dark	On	Transmissive	Conventional display mode. Backlight on, reflective subpixels black due to absence of ambient light, saturated colors.
Non-dark	On	Transflective	Backlight on, reflective subpixels reflecting ambient light, colors desaturated, power reduced if backlight dimmed.

Please refer to Pixel Qi Mode Control Application Note for more information about mode switching.

3.8 TOTAL POWER CONSUMPTION

Mode	Preliminary Value			Unit	Note
	Min.	Typ.	Max.		
Transmissive (Full Color Saturation)	2.24	2.63	3.09	W	(1) 60 fps with ANSI checkerboard pattern, BLU duty 100%
Transmissive (Full Color Saturation)	2.12	2.47	2.87	W	(1) 30 fps with ANSI checkerboard pattern, BLU duty 100%
Transflective (Low Color)	1.15	1.32	1.52	W	(1) 60 fps with ANSI checkerboard pattern, BLU duty 40%
	0.74	0.82	0.90	W	(1) 60 fps with ANSI checkerboard pattern, BLU duty 10%
	0.59	0.66	0.72	W	(1) 30 fps with ANSI checkerboard pattern, BLU duty 10%
Reflective (Black and white with 64 gray shades)	0.52	0.59	0.64	W	(1) 60 fps
Reflective (Black and white with 64 gray shades)	0.39	0.43	0.48	W	(1) 30 fps

Note (1) Total power consumption includes LCD, TCON, drivers, TFT, LED converter, DC-DC converters, and backlight unit. Power is given for ANSI checkerboard pattern and typical backlight unit voltage and current values with 100% duty cycle in transmissive mode and over a range of backlight duty cycle values in transflective mode. Note that purely transmissive mode is only possible under zero lux ambient light conditions. In transflective mode, duty cycle is typically lower than transmissive mode, but the maximum value is the same. In reflective mode, the backlight is turned off; light bar power consumption is zero.

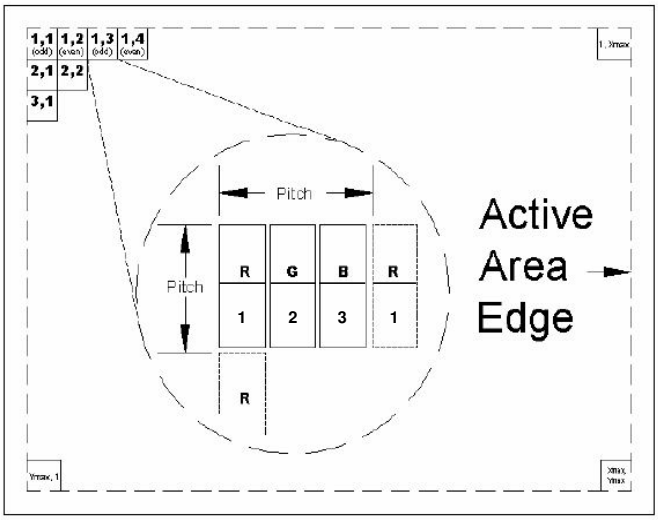
3.9 PIN ASSIGNMENT

Pin	Symbol	Description	Polarity	Remark
1	NC	No Connection (Reserve)		
2	VCC	Power Supply		
3	VCC	Power Supply		
4	VEDID	DDC power		May be connected to VCC
5	NC	No Connection (Reserve for test)		
6	CLKEDID	DDC clock		
7	DATAEDID	DDC data		
8	Rxin0-	LVDS differential data input	Negative	R0-R5, G0
9	Rxin0+	LVDS differential data input	Positive	
10	VSS	Ground		
11	Rxin1-	LVDS differential data input	Negative	G1~G5, B0, B1
12	Rxin1+	LVDS differential data input	Positive	
13	VSS	Ground		
14	Rxin2-	LVDS Differential Data Input	Negative	B2-B5,HS,VS, DE
15	Rxin2+	LVDS Differential Data Input	Positive	
16	VSS	Ground		
17	RxCLK-	LVDS differential clock input		
18	RxCLK+	LVDS differential clock input		
19	VSS	Ground		
20	NC	No Connection (Reserve)		
21	NC	No Connection (Reserve)		
22	VSS	Ground		
23	NC	No Connection (Reserve)		
24	NC	No Connection (Reserve)		
25	VSS	Ground		
26	NC	No Connection (Reserve)		
27	NC	No Connection (Reserve)		
28	VSS	Ground		
29	NC	No Connection (Reserve)		
30	NC	No Connection (Reserve)		
31	VSS	LED Ground		
32	VSS	LED Ground		
33	VSS	LED Ground		
34	NC	No Connection (Reserve)		
35	LED_PWM	LED BLU Brightness Control		
36	LED_EN	LED Converter Enable		
37	NC	No Connection (Reserve)		
38	LED_V_{CC}	LED Converter Input Power		Also referred to as VLED
39	LED_V_{CC}	LED Converter Input Power		
40	LED_V_{CC}	LED Converter Input Power		

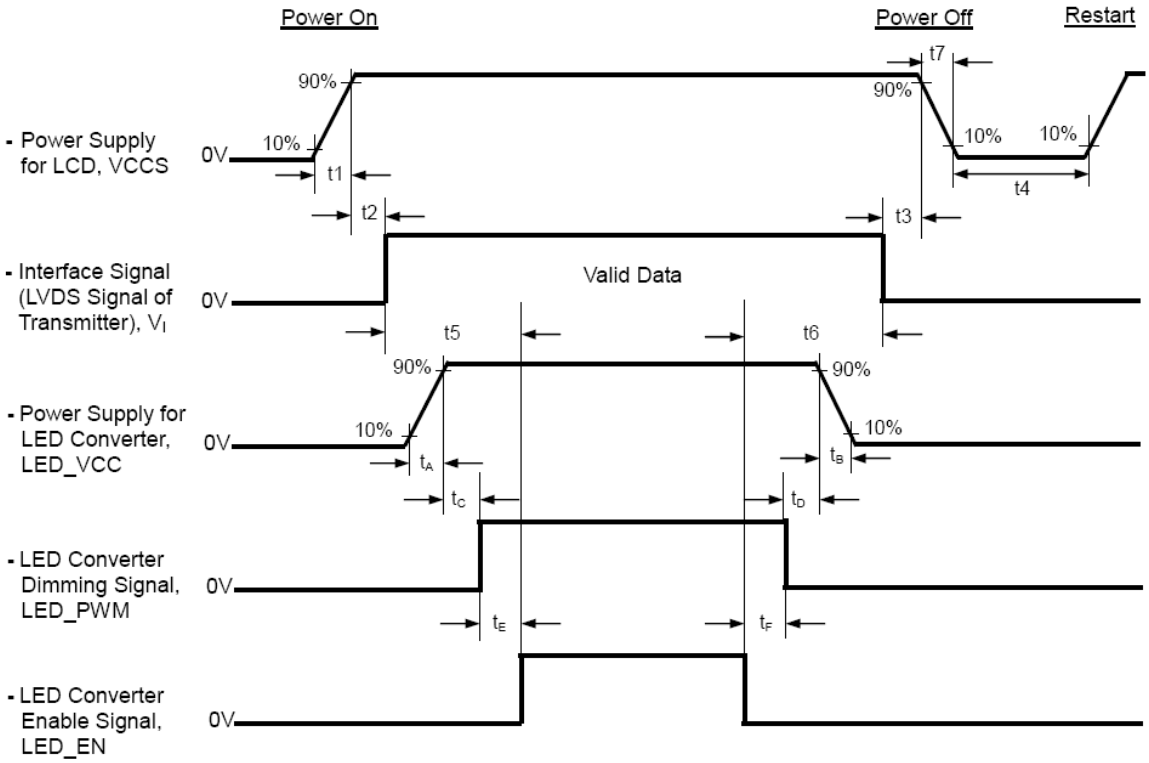
Note (1) Connector Part No.: IPEX-20455-040E-12 or equivalent

Note (2) User's connector Part No: IPEX-20453-040T-01 or equivalent

Note (3) The first pixel is odd as shown in the following figure.


1,1 (odd)
1,2 (even)
1,3 (odd)
1,4 (even)
2,1
2,2
3,1
Pitch
Pitch
R
G
B
R
1
2
3
1
R
Active
Area
Edge

3.10 POWER ON/OFF SEQUENCE



Timing Specifications:

0.5≦ t1 ≦ 10 ms

0 ≦ t2 ≦ 50 ms

0 ≦ t3 ≦ 50 ms

t4 ≧ 500 ms

t5 ≧ 200 ms

t6 ≧ 200 ms

0.5≦ t7 ≦ 10 ms

0.5≦ t_A ≦ 10 ms

0 ＜ t_B ≦ 10 ms

t_C ≧ 10 ms

t_D ≧ 10 ms

t_E ≧ 10 ms

t_F ≧ 10 ms

Note (1) Please follow the power on/off sequence described above. Otherwise, the LCD module might be damaged.

Note (2) Please avoid floating state of interface signal during invalid periods. When the interface signal is invalid, be sure to pull down the LCD power supply Vcc to 0 V.

Note (3) The backlight inverter power must be turned on after the power supply for the logic and the interface signals is valid. The backlight inverter power must be turned off before the power supply for the logic and the interface signals is invalid.

Note (4) Sometimes some slight image shows when LCD is turned off (even if the backlight is already off). To avoid this phenomenon, the Vcc falling time should follow 50us $\leqq$ t7 $\leqq$10 ms.

3.11 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 6-bit gray scale data input for the color. The higher the binary input the brighter the color. The table below provides the assignment of color versus data input.

Color		Data Signal																	
		Red						Green						Blue					
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gray Scale Of Red	Red(0)/Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(61)	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(62)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale Of Green	Green(0)/Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(61)	0	0	0	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0
	Green(62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	Green(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
Gray Scale Of Blue	Blue(0)/Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(61)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1
	Blue(62)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	Blue(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

Note (1) 0: Low Level Voltage, 1: High Level Voltage

4 OPTICAL CHARACTERISTICS

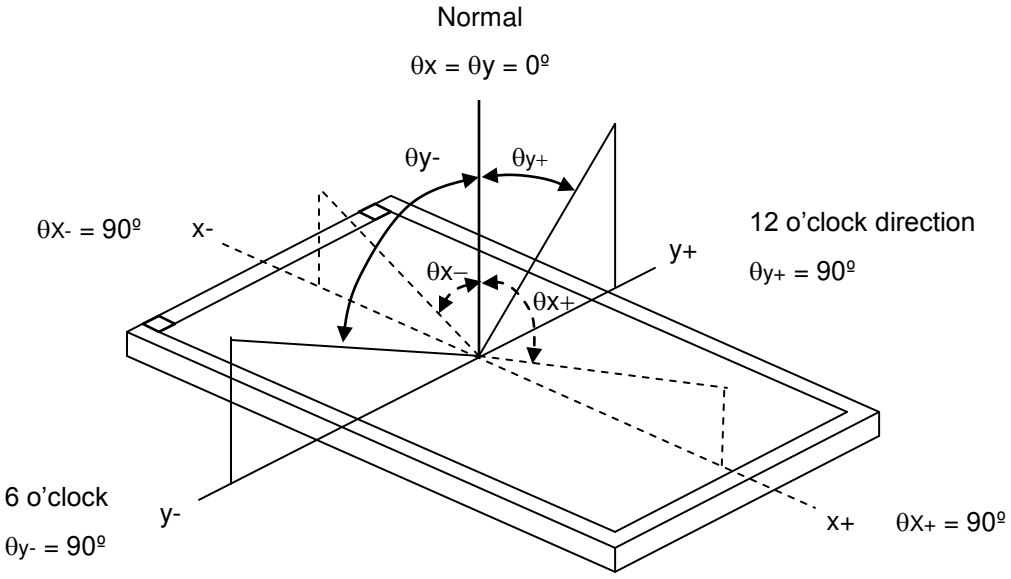
4.1 TEST CONDITIONS

Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	°C
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	V_{CC}	3.3	V
Input Signal	According to typical values in "ELECTRICAL CHARACTERISTICS"		
LED Light Bar Input Current	I_L	60	mA

4.2 OPTICAL SPECIFICATIONS

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio Transmissive		CR_T	θ_x=0°, θ_Y =0° Viewing Normal Angle	*50*	100	-	-	(1), (2), (5), (6)
Contrast Ratio Reflective		CR_R		3.5	5	-	-	(1), (2), (6), (7)
Response Time		T_R		-	6.5	11.5	ms	(3)
		T_F		-	13.5	18.5	ms	
Panel Reflectivity				23	27	-	%	(7)
Luminance of White		L	Dark room	110	160	-	cd/m^2	(1), (4), (5), (6)
		$L_{\_office}$	600 lux ambient		233			
		$L_{\_sun}$	10000+ lux ambient	1000				
Color Gamut					38	45	% NTSC	
Color Chromaticity, Transmissive	Red	Rx		TYP. -0.05	0.552	TYP. +0.05		(1)
		Ry			0.344			
	Green	Gx			0.327			
		Gy			0.558			
	Blue	Bx			0.163			
		By			0.163			
	White	Wx			0.313			
		Wy			0.342			
Color Chromaticity, Reflective @D65	White	Wx		TYP. -0.05	0.310	TYP. +0.05		
		Wy			0.350			
Viewing Angle, Transmissive Mode	Horizontal	θ_x+	CR≥10	20	30		Deg.	(1), (2), (5)
		θ_x-		20	30			
	Vertical	θ_Y+		20	30			
		θ_Y-		20	30			
Viewing Angle, Reflective Mode	Horizontal	θ_x+	CR≥4	30	40		Deg.	(1), (2), (7)
		θ_x-		30	40			
	Vertical	θ_Y+		20	30			
		θ_Y-		20	30			
White Variation (Transmissive)	5 points	δW_{5p}	θ_x=0°, θ_Y =0°		1.11	1.33		(1), (5), (6)
	13 points	δW_{13p}			1.33	1.65		
White Variation (Reflective)	5 points	δW_{r5p}			1.11	1.33		(1), (6), (7)

Note (1) Definition of Viewing Angle (θx, θy):



Note (2) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

Contrast Ratio (CR) = L63 / L0

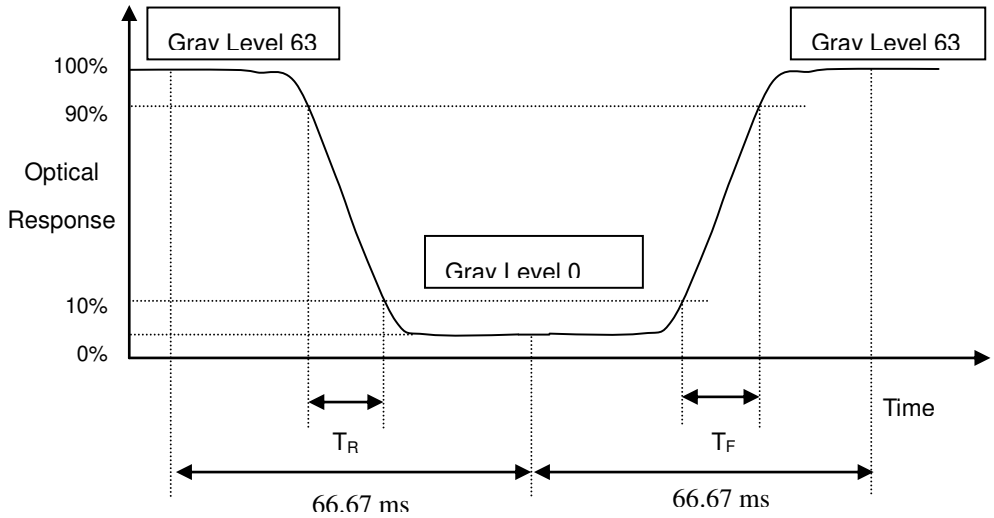
L63: Luminance of gray level 63

L 0: Luminance of gray level 0

CR = CR (1)

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (6).

Note (3) Definition of Response Time (T_R, T_F):



Note (4) Definition of Luminance of White (L):

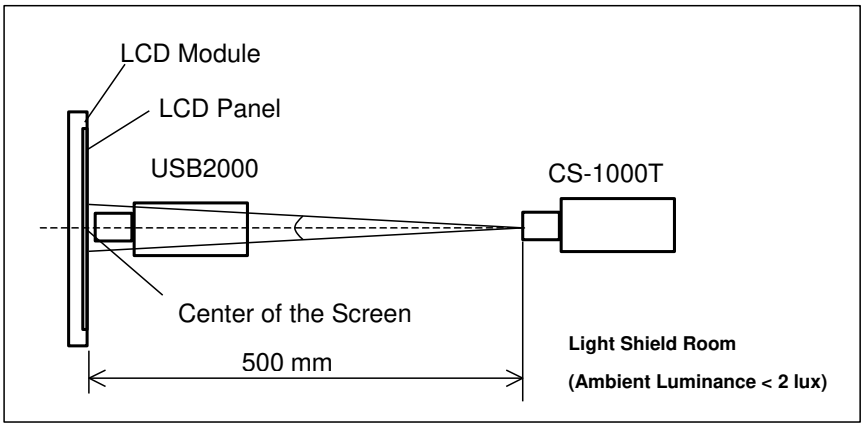
Measure the luminance of gray level 63 at center point

L = L (1)

L (x) is corresponding to the luminance of the point X at Figure in Note (6)

Note (5) Measurement Setup:

The LCD module should be stabilized at given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting backlight for 20 minutes in a windless room.



Note (6) Definition of White Variation (δW):

Measure the luminance of gray level 63 at 5 or 13 points

δW_{5p} = Maximum [L (1) ~ L (5)] / Minimum [L (1) ~ L (5)]

δW_{13p} = Maximum [L (1) ~ L (13)] / Minimum [L (1) ~ L (13)]